

#### 4. SUMMARY OF THE EIGHT CHINCOTEAGUE STUDY SITES

##### 4.1 OVERALL IMPRESSIONS FROM FIELD VISITS

Most of the interior palustrine and estuarine wetlands (in contrast to fringing estuarine marshes) are the result of the basic ridge and swale topography. On a regional scale (nearby mainland and barrier islands), these wetlands are relatively unusual features and worthy of both scientific study and preservation efforts. Chincoteague palustrine wetlands, including emergent scrub/shrub and forested, are particularly unusual in this region. For example, on Assateague, most ridge and swale topography is either saline or has been altered for waterfowl management.

Clearly, these ridge and swale wetlands generally function for ground-water recharge and discharge with the surface (water table) aquifer. Since this aquifer is largely brackish, except for a thin surface layer of freshwater input from the palustrine wetlands, the palustrine wetlands are probably instrumental in preventing the aquifer from becoming more saline. Since most of Chincoteague's ridge and swale wetlands are probably connected by this surface aquifer, this means that filling or destruction of one wetland may adversely affect other wetlands, particularly the palustrine wetlands, on Assateague. This suggests that the destruction of more than one palustrine wetland may have a cumulative effect on other untouched, undeveloped wetlands by increasing the salinity of the surface aquifer. Furthermore, these cumulative effects may include reduced freshwater inflow to adjacent estuarine marshes which may alter their estuarine nature (i.e., intermediate salinity regime, nursery value, and protection for juvenile fishes).

At this point, these suggestions of hydrologic connectivity through the surface aquifer and cumulative impacts of palustrine wetland alteration remain hypothetical. The next step is a detailed topographic and ground-water hydrologic study (see Section 6.).

##### 4.2 SUMMARY OF ADAMUS/STOCKWELL RATINGS

Summaries of the functional significance ratings for the eight sites (and two sub-sites) are given in Table 1. In section

Table 1. Functional significance ratings for each WIA and WIA subdivision evaluated in the study. Possible scores for each function are VH=very high, H=high, M=moderate, L=low, and VL=very low.

Functional Significance Ratings																										
Site Name	Groundwater Recharge	Groundwater Discharge	Flood Storage	Shoreline Anchoring	Sediment Trapping	Nutrient Retention	Long Term	Seasonal	Flood Chain Support	Downstream	In Basin	Fishery Habitat	Warm water	Species*	Wildlife Habitat	General Diversity	Waterfowl Group 1	Waterfowl Group 2	Species**	Active Recreation	Swimming	Boat Launching	Power Boating	Canoeing	Sailing	Passive Recreation and Heritage
Chincoteague Ridge/Swales	M	M	H	M	H	VH	VH	VH	M	M	M	L			H	M	M	M	M <sup>d</sup>	L	L	L	L	L	L	M
High School East	M	H	H	M	H	VH	VH	VH	M	M	M	L	M <sup>b</sup>		H	M	M	M	M <sup>d</sup>	L	L	M	L	L	L	M
Fowling Gut - Estuarine Portion	L	L	H	M	VH	VH	VH	VH	M	M	M	L	M <sup>a,b,c</sup>		M	L	L	L	H <sup>e</sup>	L	L	L	L	L	L	M
Fowling Gut - Palustrine Portion	H	H	VH	H	VH	H	H	H	M	M	M	L			M	L	L	L	L <sup>f</sup>	L	L	L	L	L	L	H
Mixed Hardwoods Swamp	H	L	VH	M	H	VH	VH	VH	M	M	M	VL			L	L	M	M	M <sup>d,g,Lf</sup>	VL	VL	VL	VL	VL	VL	M
Mire Pond Fill Site	L	L	H	M	VH	VH	VH	VH	M	M	M	L	M <sup>a,b,c</sup>		M	L	L	L	H <sup>e,Lf</sup>	L	L	L	L	M	L	M
Mire Pond Scrub-Shrub-Estuarine Portion	L	L	H	M	VH	VH	VH	VH	M	M	M	L	M <sup>a,b,c</sup>		M	L	L	L	H <sup>e,Lf</sup>	L	L	L	L	M	L	M
Mire Pond Scrub-Shrub-Palustrine Portion	H	L	VH	M	VH	VH	VH	VH	M	M	M	L			L	L	L	L	L <sup>f</sup>	L	L	L	L	L	L	M
Ocean Breezes South	L	L	H	VH	VH	VH	VH	VH	M	M	M	L	M <sup>a,b,c</sup>		M	L	L	L	H <sup>e</sup>	L	L	L	L	L	L	M
Chincoteague Channel Marsh	L	H	H	H	H	H	H	H	M	M	M	L	M <sup>a,b,c</sup>		M	L	L	L	H <sup>e</sup>	L	L	L	L	L	L	M

\*a=bluefish, b=winter flounder, c=hard clam \*\*d=wood duck, e=common egret, f=black duck, g=black-crowned night-heron

5. we discuss the Adamus/Stockwell technique and compare the ratings from our own subjective impressions formed while field-surveying the sites.

## 5. COMMENTS ON THE ADAMUS/STOCKWELL TECHNIQUE AS RELATED TO CHINCOTEAGUE WETLANDS

### 5.1 GENERAL COMMENTS

The Adamus and Stockwell method is designed to objectively assess potential wetland functional values based on simple physical, chemical, and biological indicators along with socioeconomic trends. Simple yes-no responses to 153 questions are categorized and evaluated to derive final summary ratings (very low, low, moderate, high, very high) for each of eleven functional values. Though widely regarded as an improvement over earlier attempts to develop wetland rating systems, the method remains relatively new and untested.

Upon receiving the Adamus/Stockwell document, we were impressed with the interdisciplinary breadth of the literature review. Almost any wetland scientist will find new references and ideas contained in this portion of the document.

After using the method on eight different sites on Chincoteague Island, Virginia, we have concluded that for this area the Adamus/Stockwell technique works relatively well in its current form and has even more promise if revised, regionalized, and "fine-tuned" in the future. We have identified six problem areas with the technique in its present form. Though these problems interfere somewhat with assessments, we feel that the outcomes of the Chincoteague study were not seriously affected. (See the next section for examples of possible minor problems with specific ratings.)

We have identified six problem areas with the Adamus/Stockwell technique in its present form. These are presented below in no particular order of importance.

(1) The method is best suited for the assessment of small homogenous areas. Heterogenous sites create problems for users of the Adamus technique. When answering the numerous questions that require the observer to take an average over a widespread and diverse wetland, in effect one loses the ability to describe any part of the wetland accurately. In two cases (Fowling Gut and Mire Pond Scrub/Shrub sites) we found such basic differences in wetland vegetation, hydroperiod, and flow characteristics

within the same WIA that it became necessary to divide the WIA into two sections. Of course, this criticism applies to almost all wetland assessment techniques.

(2) The method can be applied much more reliably where detailed, site-specific data are available. Detailed data, rather than gross physical features lend the strongest support to hypotheses concerning wetland functions in this assessment system. In addition, without detailed data the final rating of a wetland for a particular function may be artificially moderate. A moderate rating may mean that a wetland has a truly moderate value, or it may only mean that the assessment has been inconclusive due to a lack of detailed data. The system guards against assigning high or low values without sufficient data. This may have affected, for example, fishery and wildlife ratings at many of the Chincoteague sites.

(3) Answers to Form B depend entirely upon the perspective of the user. A reliable, functional rating method should have a high degree of accuracy and reproducibility. The questions in Form B give essentially free-reign to the user to interpret local socioeconomic trends. There also exists a high degree of latitude in assigning the final ratings. The Form B evaluation has undergone significant modification in a revision of the Adamus and Stockwell method due out in late 1986. Since these modifications were not available when this evaluation was conducted, the results for this section may be inaccurate.

(4) The method may contain a high degree of subjectivity. In the complex structure of the Form A interpretation key there may be junctures in which the outcome becomes extremely sensitive to certain questions. In fact, we found in several instances that the differences between a high and a moderate (or even a high and a low) rating could hinge upon the answer to a single question. Identification of these pivotal questions is essential. Pivotal questions could be identified through some sort of computer generated sensitivity analyses as is often done in systems analysis and operations research. The results of the analyses could then be checked for consistency and potential uneven outcomes.

(5) The method requires that experienced wetland scientists perform the assessment if results are to be accurate and reproducible. We believe that in the long run the accuracy of the ratings derived from this method will be inseparable from the skills and training of the observer (knowledge of hydrology, field botany, etc.) in all but the simplest wetlands. The method is an excellent aid that can broaden the perspective of a research scientist, but given the inherent problems described above, there remains no substitute for extensive training and experience in wetland science.

(6) The method has potential problems dealing with wetlands in different regions. While this problem did not appear to seriously affect the Chincoteague study, it is clear that the technique needs to be modified for certain regions (e.g., tropics, Pacific coast, far north). The only real problems in this area for the Chincoteague study involved the estuarine fish species supposedly important to this region (see the next section).

## 5.2 SPECIFIC COMMENTS CONCERNING THE CHINCOTEAGUE ANALYSES

In general, the Adamus/Stockwell Technique appears to have functioned well for this set of eight wetlands. This opinion is based on a comparison of calculated values versus estimated values (the latter are expert opinions based on our own field and academic experience with similar wetlands).

One of the most confusing aspects of wetlands assessments involves "effectiveness" and "opportunity." For example, at the present time a specific wetland may be potentially very effective at sediment trapping, but there may be no sediment to trap. Twenty years later after a construction activity, there may be plenty of opportunity to trap sediment. One of our biggest problems, particularly in our personal assessments of a particular site, is reconciling "effectiveness" and "opportunity." The Adamus/Stockwell technique handles this problem relatively well. Therefore, in most cases, we agree closely with the values reported in Table 1.

Several values in Table 1, however, appear to be too low or too high. For example, the ground-water discharge values for Chincoteague Channel Marsh, which has a small drainage area, seem too high (probably should be a 3 instead of a 2). On the other hand, the value for Ocean Breezes south, which has a relatively large area for infiltration and two outlets, seems too low (probably should be at least a 3 instead of a 4).

In certain cases (e.g., food chain support, wildlife habitat), the ratings are almost uniformly the same at all sites. This can be traced to the problem of insufficient field data (seasonal counts of waterfowl, fish surveys, etc.) which we discussed in 5.1.

The moderate values (3) for "fishery habitat by species" are probably too low (should be 2). These underestimates were generated by the non-inclusion of species such as spot and croaker in the Adamus listing of important estuarine dependent fishes for this region (see Table 8, page 78 in Adamus/Stockwell, 1983).

In summary, the majority of the rankings in Table 1 seem fair and consistent with our opinions based on field observations.

## 6. RESEARCH NEEDS

The functional role of the interior wetlands of barrier islands of the coastal United States has not been as intensively studied as that of riverine or tidal wetlands. In the extensive review of wetland functional values by Adamus and Stockwell (1983), few citations apply directly to hydrologic and nutrient retention values of coastal wetlands other than salt marshes. Less attention in research has been given to swales, dune slacks and other varieties of interior, coastal wetlands. On Chincoteague Island, basic research would sharpen understanding and strengthen conclusions concerning the functional role of the swale wetlands in the hydrology and ecology of the island. Basic research is time consuming and expensive. Yet if planned correctly, such work could provide an invaluable environmental management tool.

Research that could improve understanding of the hydrology and nutrient retention capacity of Chincoteague's wetlands is described briefly below.

1. Microtopographic survey. Stereo-photogrammetric aerial photography could be used to map 1' elevation contours, to identify and categorize wetlands, channels, borrow pits, drainage ditches, culverts and other drainage modifications. Large scale photography (1" = 500') would be essential. This mapping would represent a substantial improvement over existing photography and contour mapping of the island. It would be invaluable in conducting a baseline inventory and classification of wetlands and surface water bodies (e.g., probable degree of isolation) on the island. Field ground truthing would be an essential component of this work.

2. Surface water drainage. Channel cross section data, water level gauging and current velocity measurements could be made to establish stage-discharge relationships in the Jeep Trail Ditch, Fowling Gut, and Andrews Landing Gut. These data are necessary to calculate surface discharge from the island under various conditions of water stage.

3. Groundwater. On selected transects wells could be installed, soil borings examined and described qualitatively, grain size analyzed vs. depth, and possible confining layers identified for the water table aquifer. Within the wells, pump

tests would allow determination of transmissivity within the water table aquifer. Daily or weekly monitoring of water levels within wells for a minimum of one year in addition to rainfall measurements, evaporation estimates, and surface water drainage estimates would provide the basic data needed to construct wetland water budgets.

4. Simulation of water table aquifer dynamics. Ground-water models have been used successfully for aquifer simulation in other coastal environments. An existing model could be modified and validated against field data from Chincoteague and then used to quantitatively assess the effects of simplified model scenarios such as culvert removal, complete blockage of major surface drainways, and other wetland manipulations.

5. Water quality. Salinity, coliforms, total dissolved solids, dissolved N and P, metals (Pb), pH, and suspended solids (of surface water) could be monitored in major surface drainways and within wells on selected transects. This would indicate both the amount of lateral movement of pollutants from highways, septic fields, and the like and the effect of selected wetlands on interception and retention of these pollutants.

In addition to the hydrologic studies, seasonal studies of waterfowl and fishes at specific wetland sites are desirable. The results might alter the Adamus/Stockwell values for fishery and wildlife habitat functions.





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<b>16. Abstract (Limit: 200 words)</b>  At the request of the U.S. Environmental Protection Agency, a study was conducted to assess the potential hydrologic and ecologic functions of eight wetlands sites on Chincoteague Island, Virginia. These sites ranged from 4 to 21 ha and included estuarine emergent and scrub/shrub wetlands as well as palustrine emergent, scrub/shrub, and forested wetlands.  The author was asked to use the 1983 Adamus/Stockwell technique as the assessment method and to provide general descriptions of the sites and the suitability of the technique for assessing the wetlands.  This report discusses the results of the assessment and the problems with some of the ratings.			
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